SUPREME COURT OF THE UNITED STATES.

No. 611.—October Term, 1933.

Electric Cable Joint Company, Petitioner, vs. Brooklyn Edison Company, Inc.	On Writ of Certiorari to the United States Circuit Court of Appeals for the Second Circuit.

[April 2, 1934.]

Mr. Justice Stone delivered the opinion of the Court.

Certiorari was granted, — U. S. —, to review a decree of the Court of Appeals for the Second Circuit, affirming a decree of a district court holding invalid, for want of invention, the Torchio patent, No. 1,172,322, of February 23, 1916, applied for March 15, 1915, for "an improvement in protective devices for electric cable joints"; 66 F. (2d) 739. The Court of Appeals for the Sixth Circuit had previously held the patent valid and infringed. *Metropolitan Devices Corp.* v. *Cleveland Electric Illuminating Co.*, 36 F. (2d) 477.

Correct appreciation of the contentions made requires at the outset some discussion of the structure of electric cables for the transmission of high tension (voltage) electric currents and, more particularly, the causes of leakage or wastage of current at the joints of such cables, for the prevention of which the patented device is said to be useful. Cables for the transmission of high tension currents comprise a plurality of copper conductors, usually three in number, each covered with an insulating tape of paper or fabric, enclosed in an outer insulating wrapping, and all in turn surrounded by pervious insulating material filling the interstices between the conductors and saturated with oil. The whole is enclosed in a lead tube or sheath, which constitutes the outer surface or cover of the cable. In practice the cables are spliced or connected by forming a joint at the connecting ends. This is accomplished by cutting back the lead sheath for a suitable distance, bringing the ends of the conductors together and joining them.

usually by a connecting copper sleeve, and covering or surrounding them with successive wrappings or layers of insulating material, impregnated with an insulating compound such as an oil, long recognized as a desirable insulating material. A cylindrical lead sleeve is then placed over the joint and soldered at its ends to the lead sheath of the cable so as to surround and hermetically enclose the joint. Through openings made in the sleeve insulating compounds may be introduced.

Leakage of current at the joint results from imperfect insulation. Deterioration in the insulation may result from the drying out of the insulating material, particularly through loss or "bleeding" of the insulating fluid at the ends, or when the cable is cut. Also, high tension currents, ranging upwards from 15,000 volts, develop heat in the conductors and adjacent material, with consequent expansion and corresponding contraction when cooling, known as "breathing". This causes migration of the insulating compound within the cable and to some extent its extrusion, and produces cracks and voids in it, with resulting ionization of the interstitial air at high tensions, and the lowering of the dielectric strength or resistance of the cable at the joint.

The patent claimed is for a device, in combination, to prevent current leakage by improving the insulation. Claim 4, upon which alone the petitioner relies, reads:

"4. An electric cable, comprising a sheath, a line conductor having a joint, a body of pervious insulating material inclosing said joint, the said sheath being removed for a distance sufficient to expose said pervious body, a sleeve of impervious material of greater diameter than said body, inclosing the same and hermetically united at its ends to said cable sheath, a receptacle communicating with the interior of said sleeve, and an insulating fluid adapted to permeate said pervious body contained in said receptacle and the space between said body and said sleeve."

On February 11, 1927, before either the present suit or that in the Sixth Circuit was begun, an assignee of the patent and petitioner's predecessor in interest filed a disclaimer of the improvement,

"except for electric cables which comprise a line conductor, insulating wrapping permeated with insulating compound and a sheath of flexible, inelastic metal constituting a unitary product of manufacture and commerce which is portable and capable of being drawn through conduits; and except as to an insulating liquid which is fluid at ordinary working temperatures of such cables and

in quantity sufficient to supply at all times the demands made by the cable in use, and by the joint."

Petitioner's expert testified at the trial, as the prior art shows, that Torchio was not the first to discover that oil is an insulating material; that he was not the first to provide a cable with conductors enclosed in insulating material permeated with oil, or the first to make joints in a cable or to use pervious insulated wrappings of joints, or to show a sleeve enclosing the joint larger than the sheath of the cable, hermetically closed and connected to the metal sheath of the cable. The only elements enumerated in the claim, asserted to be new, are the receptacle communicating with the interior of the sleeve, and the insulating oil or liquid, fluid at low temperatures, contained in the receptacle and in the space between the sleeve and the pervious insulating material surrounding the joint.

The issue for decision is whether the addition of these elements, in combination with the others enumerated in the claim, involve invention.

In the earlier case the Court of Appeals for the Sixth Circuit held Claims 3 and 4 valid. Claim 3 embraces all the elements of Claim 4, except the communicating reservoir containing the described insulating fluid. That court did not discuss the reservoir or pass upon its effect as adding anything patentable to the combination. It concluded on the evidence before it that Torchio had substituted, in a combination which was old, a liquid insulating compound for a compound not soft enough to flow; that this was new and was enough "beyond the skill of an expert" to amount to invention, and that the patent was there infringed by the use in the combination of a joint-insulating compound "normally of the consistency of vaseline or jelly". In the present case both courts below found that the use of oil or an insulating liquid, fluid at ordinary working temperatures, within the sleeve enclosing the joint, had been disclosed in printed publications before the alleged invention by Torchio, and they held that the addition of the reservoir or receptacle containing the fluid and communicating with the interior of the sleeve did not involve invention and was known before Torchio.

Brief reference will be made to the prior art, shown by the present record, which was not before the Court of Appeals for the Sixth Circuit in the earlier case.

The British patent of Geipel, No. 11,280, of December 8, 1894, disclosed an electric cable joint box "filled with a suitable insulating material, as for example oil, wax, bitumen, or any combination of any of these according to the nature of the insulation used for the conductor . . . with paper or jute insulated conductors oil may be used." The patent states "with paper, jute, hemp, flax, cotton or other suitable insulating material the joints . . . are best surrounded by oil."

The Lemp patent, No. 534,802, of February 26, 1895, speaks of the use of oil in electric transformers in which the conductors forming the primary are insulated with asbestos "loosely wound to allow the asbestos to take up the oil". The space containing the primary "is filled with oil connected with a reservoir or supply pipe being maintained to allow for expansion under increase of temperature."

In 1907 de Gelder published at The Hague a description of the electric cable system of the city of Amsterdam. He described "high tension cables for 3,000 volts," having paper insulation impregnated "with a rather thin liquid, oily and not too resinous mass" with cable joints bound with linen tape first boiled in oil so that it is completely saturated, with the wrapped joint enclosed in a lead sleeve, soldered to the lead sheath of the cable. Through a hole cut in the top of the sleeve or socket "hot insulating mass is poured into the socket. For this purpose the same mass or rather the same oil is used as for impregnating the cable. It is a kind of resin oil." The paper also points out that the impregnating mass used with the high tension, paper insulated cables supplied by a British firm is thinner than that used in other types, that in the British cables being "a rather thin resinous oil at 15° Centigrade, 59° Fahrenheit."

Since 1911 the Consolidated Gas Electric Light & Power Company in Baltimore has used oil in insulating its cables carrying a current of 13,000 volts or more, the cables consisting of three paper-wrapped conductors, insulated with oil impregnated jute, enclosed in a lead sheath. To avoid the draining out of the cables and the consequent defective insulation in sections extending vertically from the subterranean conduits to the power houses, the cables were passed into enlarged containers or potheads containing oil, which, flowing downward in the cables, replenished the oil in the

jute insulation for distances as great as 1200 feet. Paraffin, solid at ordinary temperatures, which had originally been placed in the potheads, was found unsatisfactory. Defective insulation resulted from drying out of the cables, and in 1911 paraffin was replaced by an oil which was fluid at ordinary temperature.

Vernier, in an article on "The Laying and Maintenance of High Tension Cables", published in the journal of the Institution of Electrical Engineers in 1911 and in summarized form in "The Electrician" of March 10, 1911, discussed in detail the insulation of joints in electric cables carrying currents up to 20,000 volts. He described a cable consisting of three paper insulated conductors enclosed in a lead sheath or tube. He pointed out the dangers of voids in joint insulating material and ensuing gas ionization which result in reduced "breakdown pressure" or dielectric strength and described a method of insulating the joint by wrapping the conductors with oil impregnated tape surrounded with insulating material, all enclosed in a lead sleeve, soldered to the lead sheath of the cable. This sleeve, he stated, was then filled with an insulating compound of either "an oil or a viscous joint box compound, preferably the latter, which can run into the tubes and all parts of the joint box". Again "Such a compound must be viscous of about the consistency of thick cream at ordinary temperatures. When heated it should run as freely as heated oil so as to penetrate all crevices and it must retain these features through its life . . .". The tendency of solid compounds to form air voids was pointed out and the author's preference for a joint filled with oil or a compound viscous at ordinary temperatures was stated. Vernier's teaching of "a viscous compound which never sets" is referred to in connection with his name in Pender's American Handbook of Electrical Engineers, 1914, a standard work of authority.

Torchio himself, in a written report to his employers, in 1914, on the Berlin cable system, transmitting currents of 30,000 volts, described the cables as having joints enclosed in a lead sleeve soldered to the lead sheathing of the cable by means of "wiped joints", and as being insulated with a compound which "at normal temperature is semi-liquid and is similar to the compound used for saturation of cables". In August, 1914, an associate, in reporting to him in writing upon the underground cable system in Boston

carrying from 13,000 to 25,000 volts, described cables in use there as consisting of three conductors, paper wrapped and sheathed in lead. He described a joint box in use enclosing the insulated conductors and filled with an insulating compound which "at ordinary temperature is about the viscosity of molasses".

The prior art thus briefly outlined shows that an insulating fluid, described in Torchio's fourth claim as "adapted to permeate the pervious material surrounding the conductors", used with the other elements of the joint sleeve combination embraced in his third claim, was not new and was fully described in publications before Torchio. Its advantages in such use over non-fluid compounds had been recognized and pointed out. Hence, petitioner's claim to patentable invention must rest on the addition of the other elements enumerated in Claim 4, the receptacle containing the described insulating fluid and communicating with the sleeve.

The combination thus effected, it is said, is especially adapted to insulating the joint and is useful in replacing the loss of insulating oil, in connection with the "breathing" which takes place in the cable, particularly at the joints when in use. The expansion of the interior cable parts and insulating material, accompanying the rise in temperature, forces the oil from the joints along the cable and also causes it to exude at the joints. As the cable cools, the fluid insulation, particularly at the joint, may not be sufficient to fill it and voids result. This occurs the more readily if the insulating compound tends to solidify at cooling temperatures. These consequences are avoided by the use, in conjunction with the reservoir, of oil which is sufficiently fluid to flow freely at ordinary cable temperatures. The breathing accompanying the alternate expansion and contraction of the cable through the creation of partial vacua within the insulating material facilitates the migration of the oil within the cable. The reservoir provides for sufficient excess of reserve oil to restore the losses of oil from the joint and thus to prevent formation of the voids or to fill them.

Breathing is a natural phenomenon. The expansion and contraction of materials used in cables under the influence of changing temperatures are within the range of ordinary scientific knowledge. Breathing is readily observable and known by those having the skill of the art. Torchio did not invent it, nor was he the first to observe it. Publications before Torchio did not make use of the term, but they disclosed knowledge of the effect of temperature changes upon the cable and the insulating fluid. In

1907, de Gelder, in recommending the use of oil in joint boxes, mentioned the fact that the heating of the cable would cause the insulating mass to flow from the joints, and called attention to the probability that if the oil was pressed out by overheating "when contraction takes place water will be sucked in even though the junction box may be well sealed". He also spoke of the downward shifting or draining out of the oil in cables if elevated at or near their terminals, as had been observed in the lines of the Baltimore light and power system. The potheads used as oil reservoirs in the Baltimore installation, when full of a free flowing oil, were observed to overflow when the cables were heated, and the migration of the oil along the cables for considerable distances was also noted. Vernier noted the shrinkage of joint box insulating compounds on cooling and their tendency in the process to form vacua, and "if of a solid nature, to form blow holes or air pockets". In recommending that the joint sleeve be filled with oil he pointed out the tendency of the insulating oil to run out of the cable when cut and recommended the construction of the joint by the use of insulating tape "so as to allow the greatest possible freedom of access to the oil which will keep the insulating tapes constantly impregnated". The oil or joint box compound used, he said, "must be viscous and of about the consistency of thick cream at ordinary temperatures", and he stated that impregnation "will be greatly assisted by the constant temperature changes which the cable undergoes under changes of load". This was a clear recognition of the phenomenon of breathing and the adaptability to it of an oil which, with the heat developed in high tension cables, would flow freely "so as to penetrate all crevices".

Thus the use in cable joints of an oil, free flowing at prevailing cable temperatures, by introducing it into the joint sleeve combination of petitioner's third claim, was not only old, but before Torchio the special adaptability of that combination to the need because of the expansion and contraction of the cable structure in use had been recognized and described by publication.

To this the petitioner added the oil reservoir. The fact that the combination, without it, was old does not preclude invention by the addition of a new and useful element. *Parks* v. *Booth*, 102 U. S. 96, 104. But the addition must be the result of invention, not the mere exercise of the skill of the calling and not one plainly indicated by the prior art. Figure 1 of the patent shows the receptacle claimed, a reservoir connecting with the lead sleeve. Figure 6

shows the sleeve without the connecting reservoir, protruding upward above the wrapped joint so as to form a dome affording an increased interior oil space. The patent states "Instead of making the reservoir 10 in the form of a separate chamber communicating with the sleeve as shown in Figure 1, I may dispose the sleeve eccentrically on the joint so that the greatest clearance will be uppermost as shown at 12 in Figure 6. In this way I produce an additional holding space for the oil within the sleeve itself." This additional holding space is thus described as the equivalent of the reservoir in the form of a separate chamber or receptacle, enumerated in Claim 4. Vernier showed a like enlargement in the sleeve in sketches in his published article. He does not refer to this protuberance or dome as a reservoir, but examined in the light of the text its function is unmistakable. See *In re Bager*, 47 F. (2d) 951, 953.

The prior art had also foreshadowed the enlargement in the form of a receptacle or reservoir. Such were the potheads used by the Baltimore Power and Light Company for oil impregnation of cable insulation. Lemp showed and described an additional holding space in the form of a connecting receptacle for the oil insulation of transformers. But in any case enlargement of the oil space in the sleeve in an existing combination, so as to increase the oil supply, would clearly not involve any special skill, to say nothing of invention. It was not invention to bring into the combination its equivalent, a further enlargement and extension of the holding space in the form of the familiar device of a connecting oil cup or reservoir, so as to increase the oil supply. No more than the skill of the calling was involved. *Concrete Appliances Co.* v. *Gomery*, 269 U. S. 177; *Sargent Automatic Machine Corporation* v. *Wire-Bounds Patents Co.*, 282 U. S. 704, 713; *DeForest Radio Co.* v. *General Electric Co.*, 283 U. S. 664, 685. Neither the means employed nor the result obtained was novel. See *Hailes* v. *Van Wormer*, 20 Wall. 353; *Smith* v. *Nichols*, 21 Wall. 112; *Machine Co.* v. *Murphy*, 97 U. S. 120; *Pickering* v. *McCullough*, 104 U. S. 310; *Westinghouse Electric & Mfg. Co.* v. *Pittsburgh Transformer Co.*, 10 F. (2d) 533; *De F. Murray Mfg. Co.* v. *Sumner Iron Works*, 30 Fed. 911, 912; compare *R. Herschel Mfg. Co.* v. *Great States Corporation*, 26 F. (2d) 362, 363.

We conclude that Claim 4 is invalid, and that the decree below must be

Affirmed.